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(54) DEFLECTOR FOR SHEET-LIKE ITEMS TO BE CONVEYED

(71) We, INTERNATIONAL STANDARD ELECTRIC CORPORATION, a Corporation organised and existing under the laws of the Stae of Delaware, United States of America, of 320 Park Avenue, New York 22, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to a deflector for deflecting sheet-like articles in motion on a conveyor.

According to the present invention there is provided a deflector for the controlled deflection of sheet-like items to be conveyed, e.g. letters, vouchers, punched cards or small parts, from one transport path into another, which includes a deflector blade swivellable about an axle, an armature plate secured to the axle, two opposing magnets, one on each side of the armature plate, and at least one restoring spring which supports the movement of the blade at the beginning and slows down the blade after the latter has passed its mid position, and which spring, in the untensioned condition, holds the armature plate in the middle between the magnets, wherein the axle of the deflector blade is a torsion-bar spring which, with the masses secured to it, such as the aramture plate, the deflector blade, and other moving parts, forms a vibration system whose half period of vibration corresponds to the switchover time, and wherein the armature plate is held in the two possible end positions as a result of said magnets having variable magnetic fields.

Such a deflector has a very short switchover time so that the distances between the items to be deflected can be reduced. This results in a high capacity of the conveying channel equipped with these deflectors. Despite the short switchover times, good operational reliability and long service life are ensured by the absence of high acceleration peaks and by the low speed of the armature plate upon reaching the respective end position. This is achieved by the exact adjustment of the vibration system formed by the moving masses and the torsion-bar spring.

In addition, the deflector has a low energy consumption, because it is held in its end positions by the permanent magnets. Since the switchover of the deflector requires no disconnection of magnets or no neutralization of their magnetic fields, there are no hard-to-eliminate cut-off voltages and the magnetic field is rapidly weakened, so that short switchover times are achieved. Advantageously, use is made of short current pulses, which may also originate from a capacitor discharge.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a schematic top view of a deflector embodying the invention;

Fig. 2 is a schematic side view of the deflector of Fig. 1;

Fig. 3 shows schematically the deflector and control circuit, and

Fig. 4 shows the current-time relationship during switchover of the deflector.

The deflector shown in Figs. 1 and 2 has an axle designed as a torsion-bar spring 1. This spring 1 has one end tightly clamped in a housing or a mounting plate 2, and its other end 3 rotatably mounted in another mounting plate or in another part of the housing. Secured near the end 3 of the spring 1 is an armature plate 4 of ferromagnetic material which can rest against a magnet 5 or a magnet 6. When the spring 1 is untensioned, the armature plate 4 stands in the middle between the magnets 5 and 6.

The spring 1 is surrounded by a tube 7

which is connected with the spring 1 at the rotatable end 3 of this spring.

The other end 9 of the tube 7 is rotatably mounted on the spring 1. Mounted on this tube 7 near the clamped end of the spring 1 is a deflector blade 8 which extends into a transport path (not shown).

During operation, the armature plate 4 is placed in an end position at the magnet 5 or 6. The switchover of the blade 8 takes place after a short-time weakening of the holding magnetic field. The armature plate 4. the tube 7, and the blade 8 are set in motion with maximum acceleration by the pretensioned spring 1. The speed increases up to the mid-position of the spring 1 and then decreases to near zero, when the armature plate 4 has reached the other end position. The kinetic energy is stored and is available for the next switchover. To compensate for friction losses, the magnetic field of the magnet toward which the armature plate is moving is slightly intensified, but only until the armature plate has struck against the magnet.

An implemented deflector with a blade 80 mm in length and 240 mm in width and with a travel of 12 mm had a switchover time of considerably less than 10 ms. Smaller deflectors switch over in correspondingly shorter times.

Fig. 3 shows the deflector schematically, the torsion-bar spring being divided into two spring F1 and F2 which act on the rotatably mounted armature plate 4.

The magnets shown are permanent bar magnets M1 and M2 whose iron cores K1 and K2 carry coils S1 and S2, respectively. The bar magnets may also be replaced by suitable pot magnets. The coils S1 and S2 are connected in series opposition but may also be connected back-to-back. One end of the coils is at ground potential Uo, while the other end is connected to the make sides of changeover contacts r1 and r2, which are pushbutton controlled. The contacts r1 and r2 are shown symbolically for the sensing unit (not shown) which provides the signal to operate the deflector.

In the quiescent condition, two grounded capacitors C1 and C2 are charged from voltage sources E1 and E2, respectively, each of which has one pole connected to zero potential Uo, via the break sides of the changeover contacts r1 and r2, respectively, and via the resistors R1 and R2, respectively. In the direction of the zero potential Uo, the voltage sources E1 and E2 are oppositely polarized, whereby the capacitors C1 and C2 are oppositely charged.

In Fig. 3, the armature plate 4 rests against the iron core K2 of the magnet M2, and the spring F1 is tensioned. To move the armature plate 4 to the other end position, the contact r1 is actuated, whereby the charged capacitor C1 discharges via the coils S1 and S2 in series opposition. When flowing through the coil F2, the discharge current *i* sets up a magnetic field which weakens the field of the bar magnet M2; when flowing through the coil F1, it sets up a magnetic field which intensifies the field of the bar magnet M1. If the force of the spring F1 is greater than the force due to the magnetic fields of the coil S2 and of the bar magnet M2, the armature plate 4 separates from the iron core K2 and moves towards the iron core K1. There, it is attracted by the intensified field due to the coil S1 and the magnet M1, the spring F2 being tensioned. After the decay of the discharge current i, the armature plate 4 is held in its new position at the iron core K1 by the magnetic field of the bar magnet M1.

To return the plate 4 to its previous end position, r2 must be actuated. This discharges C2, which, in accordance with its polarity, weakens the magnetic field of the bar magnet M1 and intensifies that of the bar magnet M2.

Fig. 4 shows the variation of the discharge current i with time. At the time to, r1 or r2 is actuated. The values of the capacitor discharge circuit are advantageously chosen so that the armature plate 4 separates from the holding magnet at the time t1, and reaches its new end position at the time t2. The very short time between the instance to and t1 explains itself by the fact that, during the steep current rise, the holding magnetic field must only be weakened and need not be neutralized.

WHAT WE CLAIM IS:

1. A deflector for the controlled deflection of sheet-like items to be conveyed, e.g. letters, vouchers, punched cards or small parts, from one transport path into another, which includes a deflector blade swivellable about an axle, an armature plate secured to the axle, two opposing magnets, one on each side of the armature plate, and at least one restoring spring which supports the movement of the blade at the beginning and slows down the blade after the latter has passed its mid position, and which spring, in the untensioned condition, holds the armature plate in the middle between the magnets, wherein the axle of the deflector blade is a torsion-bar spring which, with the masses secured to it, such as the armature plate, the deflector blade, and other moving parts, forms a vibration system whose half period of vibration corresponds to the switchover time, and wherein the armature plate is held in the two possible end positions as a result of said magnets having variable magnetic fields.

2. A deflector as claimed in claim 1, wherein the torsion-bar spring has one end

clamped in place and the other end rotatably mounted, and wherein the armature plate is secured to this other end.

3. A deflector as claimed in claim 2, wherein the torsion-bar spring is surrounded by a tube connected to the torsion-bar spring by being joined to the rotatable end thereof, and wherein the deflector plate is mounted on the tube.

4. A deflector as claimed in claim 1, 2 or 3, and wherein said magnets are permanent magnets, each said magnet carrying a winding which, when a current is passed therethrough, intensifies or weakens the magnetic field of its magnet.

5. A deflector as claimed in claim 4, wherein the windings are in series opposition and, to switch over the blade are so supplied from charged capacitors that the magnetic field of the magnet holding the armature plate is weakened, while the magnetic field of the other magnet is intensified.

6. A deflector as claimed in claim 5, wherein the variation of the discharge current of the capacitor with time is so chosen that the armature plate separates from the holding permanent magnet during the current rise and lays itself against the other permanent magnet during the decay of the current in the vicinity of the current maximum.

7. A deflector for deflecting flat objects being conveyed, substantially as described with reference to the accompanying drawings.

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Chartered Patent Agent
For the Applicants

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale

Sheet 1

Fig. 1

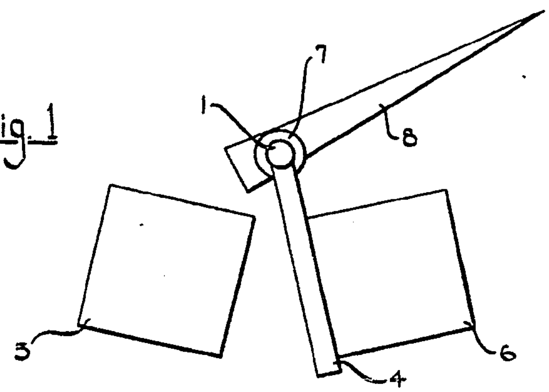

Fig 2

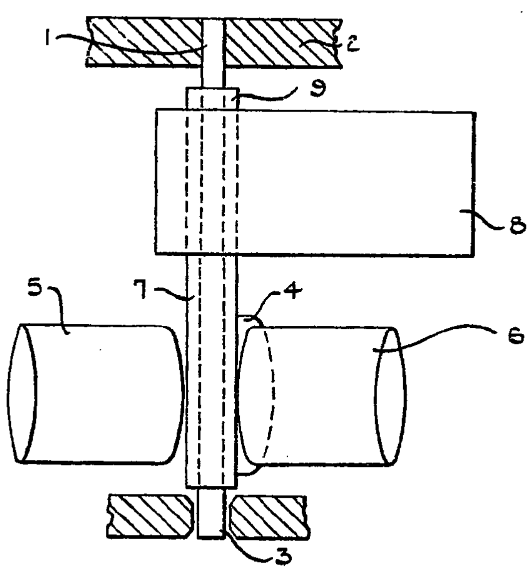

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Fig. 3

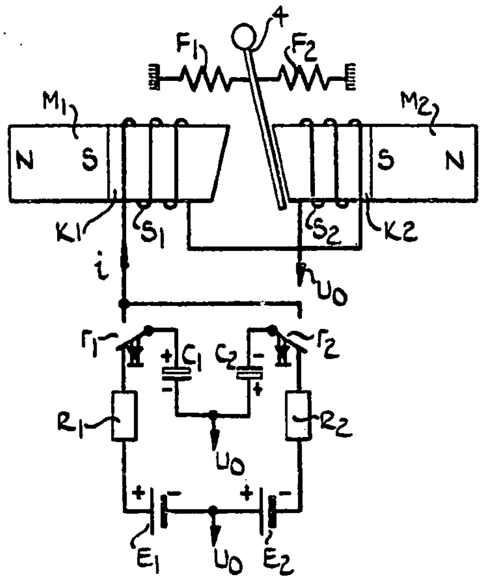
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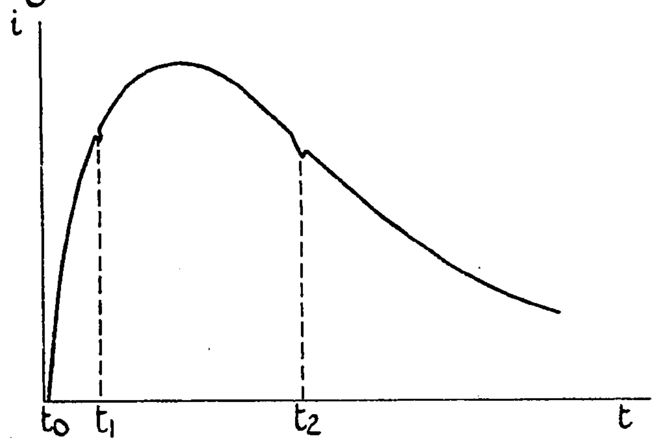
Fig. 4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